

**AMENDMENTS TO THE SPECIFICATION:**

1) Please replace the original specification with the following substitute specification. A marked version and a clean version of the substitute specification are attached on separate sheets in compliance with 37 CFR 1.125.

Additionally, please replace the abstract with the following abstract, supplied on a separate sheet, in compliance with MPEP § 608.01(b).

No new matter has been included in the substitute specification.

TITLE  
PROPULSION SYSTEM FOR DIVERS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is an U.S. national phase application under 35 U.S.C. §371 based upon co-pending International Application No. PCT/IT2004/000001 filed January 7, 2004. Additionally, this U.S. national phase application claims the benefit of priority of co-pending International Application No. PCT/IT2004/000001 filed January 7, 2004 and Italian Application No. IT PI2003A000002 filed January 9, 2003. The entire disclosures of the prior applications are incorporated herein by reference. The international application was published July 29, 2004 under Publication No. WO 2004/0627443 A1.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

(0001) The expedient validly supported by a special usable slinging from scuba divers, deep-sea divers or simple swimmers, the all one advantageously fed by a sophisticated system of rechargeable batteries, inserted inside several united watertight containers between them by interspaces in rubber or other suitable material, its regards an innovative electric propulsion means. As we know, the greatest difficulty for who does operate underwater is the shifting. Such difficulty, in certain particular conditions, exponentially increases, putting the staffs more qualified resistance to hard test, what even if been adequately about it, can run heavy risks putting its safety to risk. The innovative structure, it will allow to all specialized operators to move without this problems underwater, even if the immersions will be made in depth and prolonged for long time periods. Another very important characteristic of the system they are the reduced ones it blocks, what they will allow to move and be operated in complete freedom and any condition. The invention covers an innovative means of electric propulsion, validly supported by a special harness that can be used by scuba divers, deep-sea divers or simple amateurs, the entire apparatus advantageously powered by a

sophisticated system of rechargeable batteries inserted inside various water tight containers joined together by means of interstices of rubber or other suitable technical material. As we know, the greatest difficulty faced by anyone working underwater is moving around. This difficulty, in certain particular conditions, increases exponentially, very severely testing the resistance even of the most qualified persons who, even if adequately prepared, can incur serious risks that can endanger their safety. The innovative structure will allow all amateurs or other specialized operators to move underwater without any problem, even if they are submerged in deep water for long periods of time. Another very important characteristic of the system is its reduced size, which will make it possible to move and work in complete freedom and under any conditions.

#### BACKGROUND-ART DESCRIPTION OF THE PRIOR ART

~~To the purpose of the present patent request, turns out superfluous describing the various kinds of underwater propulsion at present used, as their working is well known from all the technicians of the sector and constitutes well known art and however they do not allow to solve the shown problem. The principal purpose of the present invention is to remove the inconveniences mentioned above, and supplied it, to all the swimmer or professional diver, with a valid and technologically propulsive system, advanced and safe to use, system able to facilitate the normal movement, also in extreme condition as the prolonged underwater permanence or the strong depths. To this result its reached, in conformity to the invention, adopting the technical solution to realize a system having the characteristics described in the independent claims. Other characteristics of the present invention, they are object of the dependent claims. For the purposes of this patent application, there is no need to describe the various types of underwater propulsion currently in use, in that their operation is known to all technicians in the sector and constitute a known art, yet do not allow for a solution to the problem involved. The principal scope of the present invention is to eliminate the disadvantages mentioned above and provide all amateur and professional divers with a valid propulsion system that is technologically advanced and safe to use, capable of~~

facilitating normal movements even under extreme conditions such as prolonged underwater stays or great depths. According to the invention, this result has been attained by adopting the technical solution of using a system with the characteristics described in the independent claims. Other characteristics of this invention are covered by the dependent claims.

#### SUMMARY OF THE INVENTION

In view of the foregoing disadvantages inherent in the known types of underwater propulsion devices, the present invention provides an improved propulsion system for scuba divers, and overcomes the above-mentioned disadvantages and drawbacks of the prior art. As such, the general purpose of the present invention, which will be described subsequently in greater detail, is to provide a new and improved propulsion system for scuba divers and method which has all the advantages of the prior art mentioned heretofore and many novel features that result in a propulsion system for scuba divers which is not anticipated, rendered obvious, suggested, or even implied by the prior art, either alone or in any combination thereof.

To attain this, the present invention essentially comprises at least one specific electric water jets or hydro-jets supported by a harness and powered by a power supply system consisting of a series of watertight containers all containing a rechargeable batteries. The power supply system has connecting interstices. The various cables of the power supply system and control circuit are contained inside a special watertight branch box. The entire propulsion system is controlled by watertight push buttons.

These together with other objects of the invention, along with the various features of novelty that characterize the invention, are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated preferred embodiments of the invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

Figure 1 is a perspective view of the preferred embodiment of the propulsion system for scuba divers constructed in accordance with the principles of the present invention.

Figure 2 is a perspective view of an alternate embodiment of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 3 is an exploded perspective view of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 4 is a perspective view of the hydro-jet of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 5 is a perspective view of an alternate embodiment of the push button of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 6 is a perspective view of the power supply system of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 7 is a perspective view of the specific water jet of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 8 is a perspective view of the watertight branch box of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 9 is an exploded perspective view of the complete power supply system of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 10 is a perspective view of the watertight container of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 11 is a perspective view of the connecting interstice of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 12 is a perspective view of individual staggered sections of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 13 is a top elevational view of the watertight container of the preferred embodiment of the propulsion system for scuba divers of the present invention.

The same reference numerals refer to the same parts throughout the various figures.

#### DISCLOSURE OF INVENTION DESCRIPTION OF THE PREFERRED EMBODIMENT

~~The advantages that are derived from the present invention consist essentially in the fact that all of the divers, deep-sea divers, or alone simple fascinated, they can validly to use the system object of the present patent to carry out movements in complete safety while they are in immersion, having so them to disposition an accessory whit reduced dimensions and very efficient and versatile. These and further advantages and features of the present invention, will be more and better included, from every technician of the branch from the description that follows and with the help of the annexed drawings, data what exemplification puts into practice of the found, but from not to consider itself in limiteted sense, in which:~~

The FIG. 1, show the system of propulsion to the entire one with all its accessories whom it is composed and moderately put on from the user with in sequence: the two hydro-jet (1C, 1D) of small dimensions; the slinging (2B) correctly applied with in obviousness the holes strengthened (5H, 5I, 5L) still free and ready for advantageously to to be used; the electrician feeding system (6) composed from varied containers containing batteries united between them by gaps in rubber or other fit material; detailed described in the following figure of drawing; the manual control developed from a watertight switch (7) positioned in the palm of the hand to the inside of the underwater wet suit, to action the switch on/off to the varied electric equipment.

The FIG. 2, show always the system of propulsion to the entire one with all its accessories of whom is composed and moderately put on from the user, where were dismissed the two side hydro-jet of small dimensions (not visible in figure), validly replaced with one of greater dimensions placed centrally. Such solution will be able to to be adopted in the case in which, for reasons of obstacle, other specific configurations are dissuaded. Also in this figure note themselves in sequence:

The slinging (2C) correctly applied with in obviousness the holes strengthened (5M, 5N, 5O, 5P) ready for advantageously to be used; the electric feeding system (6B) composed from varied containers containing traditional batteries or rechargeable, united between them by means of gaps in rubber or other fit material (detailed described in the successive figures of drawing); the manual watertight switch developed (7B) positioned in the palm of the hand inside of the wet suit, for to action the switch on/off to the varied electric equipment.

The FIG. 3, show a part of the special system of propulsion with in obviousness the special slinging, whom its locked around the waist of the user and, the holes strengthened (5, 5B, 5C, 5D, 5E, 5F, 5G) their actions is to harpoon compactly the two special hydro-jet.

~~FIG. 4 and other useful objects for the immersions. It is necessary to state that the system of stalled represented in figure with the holes strengthened (5, 5B, 5C, 5D, 5E, 5F, 5G) where come introduced the relevant bolts, it is alone of example, seen that advantageously can be used other innumerable systems normally in use, without to compromise it the correct operation~~

~~The FIG. 5, is represented an applicable changing to the button (7C), that in some case it can equipped of a strap belt action (8) to stop it strongly to the palm of the hand, to use mainly when the diver does not put on an underwater wet suit.~~

~~The FIG. 6 represents instead the system of feeding (6C) composed from varied watertight containers, all containing traditional or rechargeable batteries, united between them by means of gaps in rubber or other fit material, where were applied, thanks to of the special slots described detailed in the successive figures, other three small watertight containers (9, 9B, 9C) also they containing a traditional battery or rechargeable. Such addition, when the space agrees it, serves to develop and to increase the autonomy of the same system~~

~~The FIG. 7 show instead the small hydro-jet (1F) entire of the electric cables of whom is provided.~~

~~The FIG. 8 shows a box of derivation to hold watertight (10) in whose inside, come connected the hollow varieties of the circuit of feeding and switch, complete of the relevant holes of entrance (11, 11B, 11C, 11D, 11E, 11F) all equipped of the respective plugs in rubber that avoid to the water to penetrate inside. In the superior part it is noted the lid (12) first still of to be applied and the ring of capacity in rubber (13).~~

~~The FIG. 9, represents in detail the entire and special system of feeding of the parts that its composed with in sequence: the small stoppers (14, 14B, 14C) to introduce by pressure on the watertight containers (9D, 9E, 9F, 9G, 9H, 9I, 9L) all of one advantageously furnished by the o-rings of capacity (15, 15B, 15C); the electric cable of~~



connection (16, 16B, 16C, 16D, 16E, 16F, 16G, 16H, 16I); the two couplings (17, 18); the connection made of rubber or other fit material (19, 19B, 19C, 19D, 19E, 19F, 19G, 19H); the two couplings, with profile to "V" (20, 20B) (optional); the traditional batteries or rechargeable (21, 21B, 21C).

The FIG. 10 represents in detail a watertight container (9M) in whose inside come positioned the relevant traditional batteries or rechargeable either with in sequence: the lid (14D) to introduce by pressure on the container (9M); the o-ring of capacity in rubber (15D) or other technical material fit; the two holes of connection (22, 22B) to hold watertight; the two symbols of polarity (23, 23B) useful for the composition; (24) special underwater electrical cable with the relevant plug of capacity (25) in rubber or other technical material fit; the two leaders (26, 26B) actions to connect the relevant gaps of connection (19I) in rubber or other technical material fit.

The FIG. 11, show a gap of connection (19L) in rubber or other technical material fit, on that a special slide is assembled (20C) with profile to "V" (optional), action to connect eventual supplementary accessories.

The FIG. 12 show in detail the profile offsetted (27, 27B) places in the inferior part of all of the watertight containers (9N, 90); Such profiles, come used when want to connect themselves between them (9N, 90) with the purpose of to make different configurations of the device of feeding.

The FIG. 13, show with aerial sight, the inferior part of a watertight container (9P) where note themselves the profiles offsetted (27C); the two leaders (26C, 26D); the two gaps of connection (19M, 19N) in rubber or other technical material fit of whom a (19N) introduced correctly each other (19M) outside seat.

Reduced to its essential structure and with reference to the figures of the annexed drawings, of an innovative means of propulsion, validly sustained from a special slinging, useable from divers, deep-sea divers or simple fascinated, everything

~~advantageously feeding from a sophisticated system of batteries, traditional or rechargeable either introduced to the inside of varied watertight containers united between them by means of gaps in rubber or other technical material.~~

## BRIEF DESCRIPTION OF DRAWINGS

~~In conformity of the present invention its composed by: [0021] Means act to move a diver underwater by the small electric hydro-jet (1, 1B, 1C, 1D, 1E) validly sustained from an slinging (2, 2B, 2C) that it is hooked around of the waist of the user, and feeding by a system including a series of watertight cylinders (9, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9I, 9L, 9M, 9N, 9O, 9P) all containing a rechargeable batteries or cell accumulator (21, 21B, 21C); [0022] means to compose any type of configuration of the innovative system whit the slinging (6, 6B, 6C), by the gaps of connection (19, 19B, 19C, 19D, 19E, 19F, 19G, 19H, 19I, 19L, 19M, 19N) in rubber or other technical material fit offsetted (26, 26B, 26C, 26D, 27, 27B, 27C) places to the basic of the watertight cylinders (9, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9I, 9L, 9M, 9N, 9O, 9P); [0023] means to connect and to hollow varieties of the electrical circuit of connection, swich and feeding to the inside of a special watertight box (10), complete of the relevant holes of entrance (11, 11B, 11C, 11D, 11E, 11F) validly endowed by the respective plugs in rubber (25) that hinder to the water to filter inside; [0024] means to command all of the system by the watertight button (7, 7B) if necessary integrated with a strap (8) action to stop them strongly in the palm of the hand, to use when the diver, for varied motive, does not put on an underwater overalls; [0025] means to connect at the special slinging (2, 2B, 2C) accessories, by of the holes strengthened (5, 5B, 5C, 5D, 5E, 5F, 5G, 5H, 5I, 5L, 5M, 5N, 5O, 5P) equipped of the relevant bolts to equipment; [0026] means to provide the gaps of connection (19, 19B, 19C, 19D, 19E, 19F, 19G, 19H, 19I, 19L, 19M, 19N) in rubber or other technical material fit, with a special slide (20, 20B, 20C) with profile to "V" for to rig the supplementary accessories.~~

~~Advantageously, the special system of propulsion is easily representable in varied solutions of utilization allowing to all of the divers, deep-sea divers, simple fascinated, to~~

~~use for work or for simple amusement in entire safety. Advantageously, the special slinging (2, 2B, 2C) is in a position to block varied types of accessories like the small hidro-jet (1, 1B, 1C, 1D, 1E, 1F) by the holes strengthened (5, 5B, 5C, 5D, 5E, 5F, 5G, 5H, 5I, 5L, 5M, 5N, 5O, 5P) linked to the relevant bolts or, using other systems of riging, without to endanger the correct operation.~~

~~Advantageously, the special propulsive system, will be able to provided a watertight button (7, 7B) actions to command with only an alone hand, the swich on/off all of the system.~~

~~Advantageously, the electrical power of the battery (6, 6B, 6C) will be able to be used to feed all of the system object of the patent or for other like purposes, all of this on account of to the versatility of the building project. Advantageously, the system object of the patent, arranges of special trickiness technical actions to avoid that the water penetrate in the electric or electronic systems to compromise irretrievable the correct operation. Advantageously, the special system of propulsion, will be able to be built with the most disparate materials today in commerce. It will be in fact possible to use the common plastic matters, the aluminum, the synthetic resins, glass, the carbon, all the leagues composite, even to use varied metals like the iron, the steel, the brass and their everything been derived. In practice the details of execution are able however to vary in equivalent manner in the chape, dimensions, disposition of the elements, nature of the materials employed, without moreover to go out from the field of the idea of solution adopted and so staying in the limits of the protection reconciled from the present patent for industrial invention.~~

The advantages of the present invention consist essentially of the fact that all scuba divers, deep-sea divers or simple amateurs, can validly use the system covered by the present invention in order to move around in total safety while they are submerged, having at their disposal a device of specific dimensions but very efficient and versatile. These and other advantages and characteristics of this invention will be better and more fully understood by every technician in the field from the following description and with

the help of the attached drawings, given as exemplified embodiments of the invention, but not to be considered as limiting.

Figure 1 illustrates the complete propulsion system with all the accessories that comprise it and regularly worn by the user, with the following in sequence: the two specific water jets (1C, 1D); the harness (2B), correctly applied showing reinforced holes (5H, 5I, 5L) still free and ready to be advantageously used; the power supply system (6) consisting of various watertight containers containing traditional or rechargeable batteries, joined together by means of interstices made of rubber or other suitable material, described in detail in the following drawing tables; and the manual control consisting of a watertight switch (7) positioned in the palm of the hand inside the diving suit (7), able to turn on/turn off the various electrical devices ON or OFF.

Figure 2 illustrates the complete propulsion system with all the accessories of which it is comprised and regularly worn by the user, with the two lateral specific water jets (not visible in the figure), validly replaced by one of larger dimensions (1E) centrally positioned. This solution may be adopted in the event that, for space reasons, other specific configurations are not recommended. Figure 2 also illustrates in sequence: the harness (2C) correctly applied showing the reinforced holes (5M, 5N, 5O, 5P) ready to be advantageously used; the power supply system (6B) consisting of various watertight containers containing traditional or rechargeable batteries joined together by means of interstices made of rubber or other suitable material (described in detail in the following drawing tables); and the manual control consisting of a watertight switch (7B) positioned in the palm of the hand inside the diving suit, to turn the different electric/electronic equipment ON or OFF.

Figure 3 illustrates the propulsion system for scuba divers showing the special harness (2) complete with two hooks (3, 4) for tying it around the hips of the user and reinforced holes (5, 5B, 5C, 5D, 5E, 5F, 5G) that can hold various accessories such as the two special water jets (1, 1B) or other objects useful for diving. It is necessary to point out that the locking system, shown in the figure with the reinforced holes (5, 5B, 5C, 5D, 5E,

5F, 5G) where the relative bolts are inserted, is given by way of example only, since any number of other systems normally employed can be advantageously used without compromising correct operation.

Figure 4 illustrates the special water jet or hydro-jet (1) and its power cables.

Figure 5 represents a variant applicable to the push button (7C), which in this case is equipped with a strap (8) that can attach it firmly to the palm of the hand, to be used mainly when the diver is not wearing a diving suit.

Figure 6 on the other hand, presents the power supply system (6C) consisting of various watertight containers all containing traditional or rechargeable batteries joined together by means of interstices made of rubber or other suitable material, where three more specific watertight containers (9, 9B, 9C), also containing a traditional or rechargeable battery, have been applied thanks to the special recesses described in detail in the following tables. This addition, when space permits, serves to strengthen and increase the autonomy of the system.

Figure 7, on the other hand, shows the specific water jet (1F) complete with the electric wires with which it is fitted.

Figure 8 shows the watertight branch box (10) in which the various wires of the power supply and control circuit are attached, complete with the relative intake holes (11, 11B, 11V, 11D, 11E, 11F) all equipped with the respective rubber stoppers that prevent the water from filtering in. At the top can be seen the cover (12) before it is applied and the rubber sealing ring (13).

Figure 9 illustrates in detail the complete power supply system complete with all the parts that comprise it, in the following sequence: the specific caps (14, 14B, 14C) to be inserted under pressure on the watertight containers (9D, 9E, 9F, 9G, 9H, 9I, 9L) all advantageously equipped with sealing rings (15, 15B, 15C); the connecting cables (16,

16B, 16C, 16D, 16E, 16F, 16G, 16H, 16I); the two hooks (17, 18); the connecting interstices of rubber or other suitable material (19, 19B, 19C, 19D, 19E, 19F, 19G, 19H); the two "V"-section hooks (20, 20B) (optional); and the traditional batteries (use and discard) or rechargeable (21, 21B, 21C).

Figure 10-13 shows a series of details of the special power supply system.

Figure 10 illustrates a watertight container (9M) inside of which the relative traditional or rechargeable batteries are positioned in the following sequence: the cover (14D) to be inserted under pressure on the container (9M); the sealing ring (15D) made of rubber or other suitable technical material; the two watertight connecting holes (22, 22B); the two polarity symbols (23, 23B) used for assembling; the connecting cable (24) with the corresponding sealing plug (25) of rubber or other suitable technical material; and the two guides (26, 26B) used to hook on the relative connecting interstices (19I) made of rubber or other suitable technical material.

Figure 11 illustrates the connecting interstice (19L) of rubber or other suitable technical material to which is assembled a special block (20C) with a "V" section (optional) capable of fastening additional accessories.

Figure 12 illustrates in detail the individual staggered sections (27, 27B) located in the lower part of all the watertight containers (9N, 9O). These sections are used when the watertight containers (9N, 9O) are to be fastened together to form different configurations of the power supply device.

Figure 12 illustrates, in a top view, the lower part of the watertight container (9P) where the staggered sections can be seen (27C); the two guides (26C, 26D); the two connecting interstices (19M, 19N) are of rubber or other suitable technical material, one of which (19N) is inserted correctly and the other (19M) is outside its seat.

Reduced to its essential structure and with reference to the figures in the attached drawings, an innovative means of propulsion, validly supported by a special harness that can be used by scuba divers, deep-sea divers or simple amateurs, all of it advantageously powered by a sophisticated system of traditional or rechargeable batteries inserted inside various watertight containers joined together by means of interstices of rubber or other suitable technical material, according to the invention, includes:

means for moving around underwater thanks to specific electric water jets (1, 1B, 1C, 1E, 1F) validly supported by a harness (2, 2B, 2C) that hooks around the hips of the user and is powered by a system including a series of watertight cylinders (9, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9I, 9L, 9M, 9N, 9O, 9P) all containing a traditional or rechargeable battery/accumulator (21, 21B, 21C);

means for establishing any type of configuration of the innovative power supply system (6, 6B, 6C), thanks to the connecting interstices (19, 19B, 19C, 19D, 19E, 19F, 19G, 19H, 19I, 19L, 19M, 19N) of rubber or other suitable technical material, and a series of special staggered recesses (26, 26B, 26C, 26D, 27, 17B, 27C) located at the base of the watertight cylinders (9, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9I, 9L, 9M, 9N, 9O, 9P);

means for connecting the various cables of the power supply and control circuit inside a special watertight branch box (10), complete with the relative intake holes (11, 11B, 11C, 11D, 11E, 11F) advantageously equipped with the corresponding rubber stoppers (25) to prevent water from infiltrating inside;

means for controlling the entire system thanks to watertight push buttons (7, 7B) that could be combined with a strap (8) that can hold the buttons firmly in the palm of the hand, to be used when the diver, for various reasons, is not wearing a diving suit;  
means for attaching to the special harness (2, 2B, 2C) various types of accessories, thanks to reinforced holes (5, 5B, 5C, 5D, 5E, 5F, 5G, 5H, 5I, 5L, 5M, 5N, 5O, 5P) equipped with the corresponding supplementary bolts;

means for equipping the connecting interstices (19, 19B, 19C, 19D, 19E, 19F, 19G, 19H, 19I, 19L, 19M, 19N) of rubber or other suitable technical material, with a special block (20, 20B, 20C) with a "V" section capable of attaching possible additional accessories.

Advantageously, the special propulsion system can be readily configured in various solutions to allow all scuba divers, deep-sea divers, or amateurs to use it for work or for simple recreation.

Advantageously, the special harness (2, 2B, 2C) is able to clamp on various types of accessories such as specific water jets (1, 1B, 1C, 1D, 1E, 1F) thanks to reinforced holes (5, 5B, 5C, 5D, 5E, 5F, 5G, 5H, 5I, 5L, 5M, 5N, 5O, 5P) combined with the relative bolts or using other clamping systems, without adversely affecting its proper operation.

Advantageously, the special propulsion system may be equipped with watertight push buttons (7, 7B) to make it possible to control with one hand the activation/deactivation of the entire system.

Advantageously, the battery accessory (6, 6B, 6C) can be used to power the entire system covered by the patent or for other similar purposes, all thanks to the versatility of the construction design.

Advantageously, the system covered by the patent has some special technical features capable of preventing water from infiltrating the electrical and electronic systems and irretrievably compromising proper operation.

Advantageously, the special propulsion system may be constructed using the most disparate materials on the market today. It will, as a matter of fact, be possible to use common plastic materials, aluminum, fiberglass, carbon, all composite alloys, and even to use different metals such as iron, steel, brass and all their derivatives.



In any event, the execution details can vary in practice in an equivalent manner with regard to form, dimensions, layout of the elements, nature of the materials used, without departing from the context of the solution idea and therefore remaining within the boundaries of the protection granted by this industrial invention patent.

ABSTRACT OF THE DISCLOSURE

Electric Propulsion system supported by a special usable harness slinging from scuba divers, deep-sea divers or simple swimmers, advantageously fed by a sophisticated system of rechargeable batteries, inserted inside several united watertight containers between them. The innovative structure, allow to all specialized operators to move forward underwater even if the immersions will be made in depth and for prolonged for long time periods, through the use of a motorized propulsion module. Another characteristic of the system is that it will allow a user to move and be operated in complete freedom and under any condition.

TITLE  
PROPULSION SYSTEM FOR DIVERS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is an U.S. national phase application under 35 U.S.C. §371 based upon co-pending International Application No. PCT/IT2004/000001 filed January 7, 2004. Additionally, this U.S. national phase application claims the benefit of priority of co-pending International Application No. PCT/IT2004/000001 filed January 7, 2004 and Italian Application No. IT PI2003A000002 filed January 9, 2003. The entire disclosures of the prior applications are incorporated herein by reference. The international application was published July 29, 2004 under Publication No. WO 2004/0627443 A1.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The invention covers an innovative means of electric propulsion, validly supported by a special harness that can be used by scuba divers, deep-sea divers or simple amateurs, the entire apparatus advantageously powered by a sophisticated system of rechargeable batteries inserted inside various water tight containers joined together by means of interstices of rubber or other suitable technical material. As we know, the greatest difficulty faced by anyone working underwater is moving around. This difficulty, in certain particular conditions, increases exponentially, very severely testing the resistance even of the most qualified persons who, even if adequately prepared, can incur serious risks that can endanger their safety. The innovative structure will allow all amateurs or other specialized operators to move underwater without any problem, even if they are submerged in deep water for long periods of time. Another very important characteristic of the system is its reduced size, which will make it possible to move and work in complete freedom and under any conditions.

## DESCRIPTION OF THE PRIOR ART

For the purposes of this patent application, there is no need to describe the various types of underwater propulsion currently in use, in that their operation is known to all technicians in the sector and constitute a known art, yet do not allow for a solution to the problem involved. The principal scope of the present invention is to eliminate the disadvantages mentioned above and provide all amateur and professional divers with a valid propulsion system that is technologically advanced and safe to use, capable of facilitating normal movements even under extreme conditions such as prolonged underwater stays or great depths. According to the invention, this result has been attained by adopting the technical solution of using a system with the characteristics described in the independent claims. Other characteristics of this invention are covered by the dependent claims.

## SUMMARY OF THE INVENTION

In view of the foregoing disadvantages inherent in the known types of underwater propulsion devices, the present invention provides an improved propulsion system for scuba divers, and overcomes the above-mentioned disadvantages and drawbacks of the prior art. As such, the general purpose of the present invention, which will be described subsequently in greater detail, is to provide a new and improved propulsion system for scuba divers and method which has all the advantages of the prior art mentioned heretofore and many novel features that result in a propulsion system for scuba divers which is not anticipated, rendered obvious, suggested, or even implied by the prior art, either alone or in any combination thereof.

To attain this, the present invention essentially comprises at least one specific electric water jets or hydro-jets supported by a harness and powered by a power supply system consisting of a series of watertight containers all containing a rechargeable batteries. The power supply system has connecting interstices. The various cables of the power

supply system and control circuit are contained inside a special watertight branch box. The entire propulsion system is controlled by watertight push buttons.

These together with other objects of the invention, along with the various features of novelty that characterize the invention, are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and the specific objects attained by its uses, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated preferred embodiments of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

Figure 1 is a perspective view of the preferred embodiment of the propulsion system for scuba divers constructed in accordance with the principles of the present invention.

Figure 2 is a perspective view of an alternate embodiment of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 3 is an exploded perspective view of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 4 is a perspective view of the hydro-jet of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 5 is a perspective view of an alternate embodiment of the push button of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 6 is a perspective view of the power supply system of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 7 is a perspective view of the specific water jet of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 8 is a perspective view of the watertight branch box of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 9 is an exploded perspective view of the complete power supply system of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 10 is a perspective view of the watertight container of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 11 is a perspective view of the connecting interstice of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 12 is a perspective view of individual staggered sections of the preferred embodiment of the propulsion system for scuba divers of the present invention.

Figure 13 is a top elevational view of the watertight container of the preferred embodiment of the propulsion system for scuba divers of the present invention.

The same reference numerals refer to the same parts throughout the various figures.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

The advantages of the present invention consist essentially of the fact that all scuba divers, deep-sea divers or simple amateurs, can validly use the system covered by the present invention in order to move around in total safety while they are submerged, having at their disposal a device of specific dimensions but very efficient and versatile. These and other advantages and characteristics of this invention will be better and more fully understood by every technician in the field from the following description and with the help of the attached drawings, given as exemplified embodiments of the invention, but not to be considered as limiting.

Figure 1 illustrates the complete propulsion system with all the accessories that comprise it and regularly worn by the user, with the following in sequence: the two specific water jets (1C, 1D); the harness (2B), correctly applied showing reinforced holes (5H, 5I, 5L) still free and ready to be advantageously used; the power supply system (6) consisting of various watertight containers containing traditional or rechargeable batteries, joined together by means of interstices made of rubber or other suitable material, described in detail in the following drawing tables; and the manual control consisting of a watertight switch (7) positioned in the palm of the hand inside the diving suit (7), able to turn on/turn off the various electrical devices ON or OFF.

Figure 2 illustrates the complete propulsion system with all the accessories of which it is comprised and regularly worn by the user, with the two lateral specific water jets (not visible in the figure), validly replaced by one of larger dimensions (1E) centrally positioned. This solution may be adopted in the event that, for space reasons, other specific configurations are not recommended. Figure 2 also illustrates in sequence: the harness (2C) correctly applied showing the reinforced holes (5M, 5N, 5O, 5P) ready to be advantageously used; the power supply system (6B) consisting of various watertight containers containing traditional or rechargeable batteries joined together by means of interstices made of rubber or other suitable material (described in detail in the following drawing tables); and the manual control consisting of a watertight switch (7B) positioned in the palm of the hand inside the diving suit, to turn the different electric/electronic equipment ON or OFF.

Figure 3 illustrates the propulsion system for scuba divers showing the special harness (2) complete with two hooks (3, 4) for tying it around the hips of the user and reinforced holes (5, 5B, 5C, 5D, 5E, 5F, 5G) that can hold various accessories such as the two special water jets (1, 1B) or other objects useful for diving. It is necessary to point out that the locking system, shown in the figure with the reinforced holes (5, 5B, 5C, 5D, 5E, 5F, 5G) where the relative bolts are inserted, is given by way of example only, since any number of other systems normally employed can be advantageously used without compromising correct operation.

Figure 4 illustrates the special water jet or hydro-jet (1) and its power cables.

Figure 5 represents a variant applicable to the push button (7C), which in this case is equipped with a strap (8) that can attach it firmly to the palm of the hand, to be used mainly when the diver is not wearing a diving suit.

Figure 6 on the other hand, presents the power supply system (6C) consisting of various watertight containers all containing traditional or rechargeable batteries joined together by means of interstices made of rubber or other suitable material, where three more specific watertight containers (9, 9B, 9C), also containing a traditional or rechargeable battery, have been applied thanks to the special recesses described in detail in the following tables. This addition, when space permits, serves to strengthen and increase the autonomy of the system.

Figure 7, on the other hand, shows the specific water jet (1F) complete with the electric wires with which it is fitted.

Figure 8 shows the watertight branch box (10) in which the various wires of the power supply and control circuit are attached, complete with the relative intake holes (11, 11B, 11V, 11D, 11E, 11F) all equipped with the respective rubber stoppers that prevent the



water from filtering in. At the top can be seen the cover (12) before it is applied and the rubber sealing ring (13).

Figure 9 illustrates in detail the complete power supply system complete with all the parts that comprise it, in the following sequence: the specific caps (14, 14B, 14C) to be inserted under pressure on the watertight containers (9D, 9E, 9F, 9G, 9H, 9I, 9L) all advantageously equipped with sealing rings (15, 15B, 15C); the connecting cables (16, 16B, 16C, 16D, 16E, 16F, 16G, 16H, 16I); the two hooks (17, 18); the connecting interstices of rubber or other suitable material (19, 19B, 19C, 19D, 19E, 19F, 19G, 19H); the two "V"-section hooks (20, 20B) (optional); and the traditional batteries (use and discard) or rechargeable (21, 21B, 21C).

Figure 10-13 shows a series of details of the special power supply system.

Figure 10 illustrates a watertight container (9M) inside of which the relative traditional or rechargeable batteries are positioned in the following sequence: the cover (14D) to be inserted under pressure on the container (9M); the sealing ring (15D) made of rubber or other suitable technical material; the two watertight connecting holes (22, 22B); the two polarity symbols (23, 23B) used for assembling; the connecting cable (24) with the corresponding sealing plug (25) of rubber or other suitable technical material; and the two guides (26, 26B) used to hook on the relative connecting interstices (19I) made of rubber or other suitable technical material.

Figure 11 illustrates the connecting interstice (19L) of rubber or other suitable technical material to which is assembled a special block (20C) with a "V" section (optional) capable of fastening additional accessories.

Figure 12 illustrates in detail the individual staggered sections (27, 27B) located in the lower part of all the watertight containers (9N, 9O). These sections are used when the watertight containers (9N, 9O) are to be fastened together to form different configurations of the power supply device.

Figure 12 illustrates, in a top view, the lower part of the watertight container (9P) where the staggered sections can be seen (27C); the two guides (26C, 26D); the two connecting interstices (19M, 19N) are of rubber or other suitable technical material, one of which (19N) is inserted correctly and the other (19M) is outside its seat.

Reduced to its essential structure and with reference to the figures in the attached drawings, an innovative means of propulsion, validly supported by a special harness that can be used by scuba divers, deep-sea divers or simple amateurs, all of it advantageously powered by a sophisticated system of traditional or rechargeable batteries inserted inside various watertight containers joined together by means of interstices of rubber or other suitable technical material, according to the invention, includes:

means for moving around underwater thanks to specific electric water jets (1, 1B, 1C, 1E, 1F) validly supported by a harness (2, 2B, 2C) that hooks around the hips of the user and is powered by a system including a series of watertight cylinders (9, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9I, 9L, 9M, 9N, 9O, 9P) all containing a traditional or rechargeable battery/accumulator (21, 21B, 21C);

means for establishing any type of configuration of the innovative power supply system (6, 6B, 6C), thanks to the connecting interstices (19, 19B, 19C, 19D, 19E, 19F, 19G, 19H, 19I, 19L, 19M, 19N) of rubber or other suitable technical material, and a series of special staggered recesses (26, 26B, 26C, 26D, 27, 17B, 27C) located at the base of the watertight cylinders (9, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9I, 9L, 9M, 9N, 9O, 9P);

means for connecting the various cables of the power supply and control circuit inside a special watertight branch box (10), complete with the relative intake holes (11, 11B, 11C, 11D, 11E, 11F) advantageously equipped with the corresponding rubber stoppers (25) to prevent water from infiltrating inside;

means for controlling the entire system thanks to watertight push buttons (7, 7B) that could be combined with a strap (8) that can hold the buttons firmly in the palm of the hand, to be used when the diver, for various reasons, is not wearing a diving suit; means for attaching to the special harness (2, 2B, 2C) various types of accessories, thanks to reinforced holes (5, 5B, 5C, 5D, 5E, 5F, 5G, 5H, 5I, 5L, 5M, 5N, 5O, 5P) equipped with the corresponding supplementary bolts;

means for equipping the connecting interstices (19, 19B, 19C, 19D, 19E, 19F, 19G, 19H, 19I, 19L, 19M, 19N) of rubber or other suitable technical material, with a special block (20, 20B, 20C) with a "V" section capable of attaching possible additional accessories.

Advantageously, the special propulsion system can be readily configured in various solutions to allow all scuba divers, deep-sea divers, or amateurs to use it for work or for simple recreation.

Advantageously, the special harness (2, 2B, 2C) is able to clamp on various types of accessories such as specific water jets (1, 1B, 1C, 1D, 1E, 1F) thanks to reinforced holes (5, 5B, 5C, 5D, 5E, 5F, 5G, 5H, 5I, 5L, 5M, 5N, 5O, 5P) combined with the relative bolts or using other clamping systems, without adversely affecting its proper operation.

Advantageously, the special propulsion system may be equipped with watertight push buttons (7, 7B) to make it possible to control with one hand the activation/deactivation of the entire system.

Advantageously, the battery accessory (6, 6B, 6C) can be used to power the entire system covered by the patent or for other similar purposes, all thanks to the versatility of the construction design.

Advantageously, the system covered by the patent has some special technical features capable of preventing water from infiltrating the electrical and electronic systems and irremediably compromising proper operation.

Advantageously, the special propulsion system may be constructed using the most disparate materials on the market today. It will, as a matter of fact, be possible to use common plastic materials, aluminum, fiberglass, carbon, all composite alloys, and even to use different metals such as iron, steel, brass and all their derivatives.

In any event, the execution details can vary in practice in an equivalent manner with regard to form, dimensions, layout of the elements, nature of the materials used, without departing from the context of the solution idea and therefore remaining within the boundaries of the protection granted by this industrial invention patent.